The influence of Fenoterol on P_{50} and 2.3-DPG-Concentration in vitro and in vivo

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Beside the well-known cardiac side-effects, Fenoterol has a significant influence on the glucose metabolism, as shown by UNBEHAUN (3) and CONRADT (1). By the concentration of 2.3-DPG the glucose metabolism also has an influence on the P_{50} of the maternal haemoglobin and thus on the O_2-saturation of the maternal blood. On the other hand, MEIER et al. (2) showed that after a therapy of Fenoterol given intravenously for at least 1 week, a shift of the O_2-disso ciation curve to the right can be noticed.
Hence it was to scrutinize by in vitro tests, whether there was a direct influence of Fenoterol on the erythrocytes, respectively on the P_{50} of maternal haemoglobin. For that purpose, blood was incubated at a temperature of 37° C with the hundredfold substance concentration of Fenoterol, that is with 50 µg/100 ml, for a time up to 28 hours. To the incubation sediment 150 mg% glucose and 0,2 ml of an Ampicillin-Refobacin-solution were added. The analysis was done by photometric means with the Erythrox-system. The 2.3-DPG-concentration was defined encymatically. There are no differences between the erythrocytes incubated with, respectively without Fenoterol. The oscillation of the P_{50}-rates reflects oscillatory phenomena inside the metabolism of the erythrocytes. The alterion of the oscillation frequency takes 8 hours. The 2.3-DPG-levels oscillate in the same way as the P_{50}-rates. The same characteristics - dependent on time - of the P_{50} and the 2.3-DPG-levels were shown by 2-day-old erythrocytes as well as 20-day-old erythrocytes which were incubated with and without Fenoterol. Consequently, Fenoterol has no influence on the oscillation parameter of the red blood cell. From the characteristics of the erythrocytes incubated with Fenoterol it might be concluded that the ß-receptors on the erythrocyte membrane are not either existent or available.
The in vivo studies were conducted on 10 patients in the last trimenon. We took venous blood from the patients before beginning the therapy as well as 3, 6 and 24 hours afterwards. From the washed erythrocyte suspension the halfsaturation pressure was measured by the Erythrox-system. From a further share of this blood the 2.3-DPG-content and acid-base-status was defined. We found in all patients a tending decrease of P_{50} with a maximum at 6 hours after therapy was started. As a matter of fact, the basic values of the P_{50} were reached again after 24 hours. The 2.3-DPG-concentration of the erythrocytes showed identical alterations. The lowest concentration was measured also 6 hours after the begin of the therapy, whilst 24 hours after the begin of the therapy the 2.3-DPG-concentration in the red blood cell corresponded with the one before the begin of the therapy. The P_{O_2}-value of the blood testings show an

exactly contrary characteristic of the tested parameter. Already 3 hours after the begin of the therapy the P_{O2} in the maternal venous blood is raised and then decreases again within 24 hours while using Fenoterol. According to the decrease of the P_{50} we find a raised O_2-content of the maternal haemoglobin.
Hence, among other reasons, the decrease of the 2.3-DPG-concentration is regarded as causative for the alteration of the P_{50} in the maternal blood. The shift to the left of the O_2-dissociation curve leads to a reduced Oxygen-consumption of the maternal blood by the fetus. Thus, with a simultaneously existing insufficiency of the placenta an risk for the fetus during the early stage of tocolysis has to be discussed. In an extensive research the exact biochemical mechanism of this alteration will be verified in vivo on a larger number of patients.

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